

## WHAT IS CLAIMED IS:

1           1. A bottom hole assembly for horizontal drilling  
2 comprising a mud motor having a bit mounted on its  
3 forward end, the mud motor including axially extending  
4 bearing, transmission and power sections, said sections  
5 including a bent housing, an axially extending bearing  
6 mandrel rotationally and axially supported in the bearing  
7 section, the bearing section and the power section having  
8 respective axes at a small angle relative to one another,  
9 the bit being carried by the bearing mandrel, the  
10 transmission section transmitting torque from the power  
11 section to the bearing mandrel to rotationally drive the  
12 bit, and a sonde for electromagnetic signalling of its  
13 location and other data relating to its orientation to  
14 the surface, the sonde being located on the bottom hole  
15 assembly between the bit and the power section.

1           2. A bottom hole assembly as set forth in claim 1,  
2 wherein the sonde is located within a space limited by  
3 the ends of the bearing mandrel.

1           3. A bottom hole assembly as set forth in claim 1,  
2 wherein the bearing section includes a bearing  
3 rotationally supporting the bearing mandrel for rotation  
4 about an axis and having an outer radius, the sonde lying  
5 in a zone limited by the outer radius of said bearing.

1           4. A bottom hole assembly as set forth in claim 3,  
2 wherein said sonde is rearward of said bearing.

1           5. A mud motor for horizontal directional drilling  
2 comprising a bearing section, a transmission section, and  
3 a power section, the bearing section including a shaft  
4 for driving a bit and bearing structure for radially and

5 axially supporting the shaft, the power section including  
6 a rotor operated by fluid power of mud received from a  
7 drill string, the transmission section transferring power  
8 from the rotor of the power section to the shaft, the  
9 bearing, transmission and power sections having  
10 respective surrounding housing areas, and a sonde carried  
11 on a housing area forward of the power section.

1 6. A mud motor as set forth in claim 5, wherein the  
2 housing area associated with the bearing section  
3 surrounds the shaft, said shaft surrounding housing area  
4 having a wall with a pocket, the sonde being disposed in  
5 said pocket.

1 7. A mud motor as set forth in claim 6, including a  
2 cover overlying the pocket to protect the sonde removably  
3 secured to the shaft surrounding housing area.

1 8. A mud motor as set forth in claim 7, wherein  
2 said cover is secured to said surrounding housing area  
3 with a plurality of screws threaded into said shaft  
4 surrounding housing area.